Soil Conservation

March 1979

U.S. Department of Agriculture

Gullystopping Gives Ski Slopes a Lift 4

Tenacious Trefoils 10

A Year's Worth of Conservation 17

From the Administrator

Technology for Conservation: Why Not the Best?

To bring the "right and best" technology to bear on the conservation of soil, water, and related resources is a continuing challenge to the Soil Conservation Service, conservation districts, and land users.

The challenge will grow greater as the Nation embarks on new initiatives, such as reclamation of surface-mined lands and control of agriculture-related nonpoint pollution.

SCS's traditional position on the matter remains the same: There simply is no alternative to the best available technology to correct conservation problems.

In practice, for a number of reasons, we and our conservation partners do not always achieve the objective of excellence we have set for ourselves.

To keep and improve on our good reputation for high-quality work, SCS and districts together need to evaluate our approaches, practices, and procedures regularly to insure high performance standards.

District conservationists should consult with districts in the development and revision of SCS field technical guides so that standards and specifications are adapted to local conditions. District officials have a great deal to contribute to delineating the diversity of local resources and problems.

Valuable and basic as they are, technical guides are not rulebooks cast in stone. It is up to local conservationists to take advantage of the opportunities that the guides provide to develop alternative approaches to solving unusual conservation problems.

There should be wide recognition of the need for employees at the district level to undergo periodic training. District conservationists especially need to keep current on the constant changes in conservation technology through training sponsored by SCS and others.

No single factor has more significance in high-quality conservation work than an innovative spirit pervading the entire conservation field. The search for better answers should be widespread and unremitting.

There should be feedback and "feedforward": new techniques and ideas demonstrated in the field should be communicated upward, and new technological findings should be channeled from the national, technical service center, State, and area levels downward to the district level.

It is in the dynamic pooling of SCS and districts' distinctive knowledge and experience that the "right and best" technology will be put to use in conserving the Nation's natural resource base.

Mel Davis

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Soil Conservation

Contents

From the Administrator 2

Skiing in Winter, Gullies in Summer 4
Glenn Garvey

Farm Pond Saves Energy 6
Charles F. McCluskey, Jr., and Charles N. Rinehart

Keeping the Airport in Place 7
Albert Neu

Water Springs Up on the Range 8
Kerry Powers

An Unequaled Record 9
Dean White and Ron Nadwornick

Trefoils: Backbone of Erosion Control 10
Jack Carlson and Stan Swanson

Counting on You 12
William G. Hance

Tree Bank for Stevens County 14
Branislav Lalich

SCS on Display 15

Cowboy Preacher 16
Gene Warren

Conservation Highlights 1978 17

Research Roundup 21

Meetings 23

Cover:
The annual report of SCS activities for fiscal year 1978 shows that SCS helped landowners install nearly 500,000 acres of stripcropping during the year. See pages 17 through 20. (Photo, Erwin Cole.)

Skiing in Winter Gullies in Summer

by Glenn Garvey

Skiers swooshing down snow-covered hills in winter don't cause erosion, but water running down the same steep slopes the rest of the year does. When tree cover is removed from rugged hills to make ski slopes and when parking lots are carved out of sandy side hills, problems with erosion often follow.

After years of fighting erosion, the Lakewood Mardi-Gras Association, a nonprofit group which operates the Paul Bunyan Ski Hill in Lakewood, Wis., decided that they needed help. Their high yearly maintenance bills were making it difficult for them to meet their loan payments. They requested financial and technical assistance through the Lumberjack Resource Conservation and Development (RC&D) Area to fight the erosion problem. The Oconto County Soil and Water Conservation District board of supervisors agreed to help because controlling the erosion would benefit the community. They requested a high priority for assistance from the 10-county RC&D board of directors and it was approved.

Paul Bunyan Ski Hill had begun as a small, one rope-tow ski hill for children in the early sixties. At that time, Lakewood, in the heart of the Nicolet National Forest, was a very quiet place from December to April. But a community with a population of more than ½ million was only an hour's drive away. In 1965, members of the Lakewood community, aware of a growing interest in outdoor recreation in the area, decided to expand the ski hill.

To raise money for their expansion project, the association sold membership certificates to 100 local rural people and to 20 people from nearby urban areas. An 11-member board was set up to operate the ski hill. USDA's Farmers Home Administration loaned the association $98,000.

With the money the members had a well drilled, purchased snow-making equipment, installed a T-bar lift, and completed the chalet. They added parking lots to accommodate the increased business.

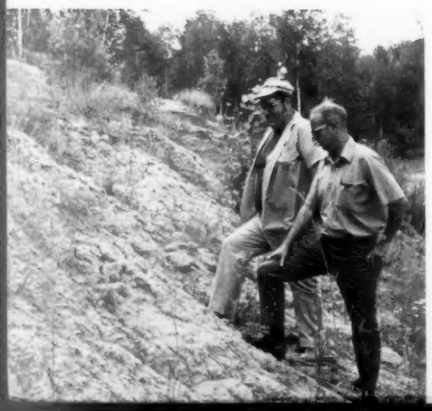
When they discovered that they needed more land to anchor the new T-bar lift farther back on the hill, association members arranged an exchange with USDA's Forest Service for an adjoining 40-acre parcel of land in the Nicolet National Forest.

The association hired two local people to manage the chalet, the food business, and the ski rental facilities and to arrange for the operation of the rope tows, the T-bar lift, and the snow-making equipment. Up to 25 people were employed during the ski season.

While all the operational activities were being carried out smoothly in winter, the battle to keep the gullies from forming in the sandy soils went on each summer.

As the first step in planning erosion control, the Soil Conservation Service made soil surveys and helped the association develop a resource conservation plan. SCS then helped the association develop an RC&D measure plan to control critical erosion. After the plan was agreed to, SCS proceeded with engineering designs.

RC&D financial assistance was



At left, Raoul Schottky (left), Paul Bunyan Ski Hill Board member, and District Conservationist Glenn Garvey discuss treatment for an eroding area. Treatment includes smoothing, adding topsoil, seeding, fertilizing, liming, and mulching. At right, aspen netting was used to protect a newly seeded area beside the main parking lot.

approved by SCS. A performance of work agreement was arranged whereby SCS cost-shared 75 percent of the estimated cost and the local organization contributed 25 percent of the cost by providing labor and equipment. Thus the association's actual cash outlay was minimal.

The plans called for widening the entrance road, seeding and sloping the adjoining roadbanks, and vegetating the eroding back slopes of a parking lot. There were many bare spots on the hill, along the T-bar lift, and in an area where soil had been borrowed to smooth out the hillside. More than 6 acres was seeded. To save labor, seed and fertilizer were spread with a hydroseeder. Lime was spread from trucks and by hand. Chopped straw, mixed with an asphalt emulsion, was blown over the seed as a mulch. The hydroseeder and mulcher were borrowed from the Forest Service. On some of the area, rolls of aspen netting were used as a mulch.

The slope of one of the upper parking lots was more than 6 percent. Each year cars slid into each other as they tried to pull out of the snow-covered parking area. The lot was reshaped to make it more level, cutting down on erosion as well as accidents.

To safely move runoff water down from the top of the wooded hills, through the parking lot, and into a natural seepage field, more than 2,200 feet of stone-lined waterways and a shorter blacktop waterway were constructed. A snowmobile trail, part of a 300-mile system, was reshaped to act as a diversion and channel the water through one of four water control structures. All of the runoff is then funneled into a large pipe drop structure with a heated concrete apron in the main parking lot.

Off-road vehicles such as minibikes, motorcycles, and four-wheel drive vehicles had been using parts of the ski hill and parking areas as a hill-climbing area each summer. Severe gullying had followed in their tracks. To protect the critical areas from off-road vehicles, more than 1,200 feet of ½-inch steel cable fencing was installed. With the deep sandy and gravelly soils and steep slopes, this kind of control was necessary to avoid more gullies.

"Gullies cost money," said Don Bartels, president of the Mardi-Gras Association. "Erosion problems prevented us from using all of our parking facilities and limited our chances for expansion. With the improved parking facilities and with erosion controlled on the hills and the chalet area, we can now handle more skiers. This improvement provides a stimulus to future expansion.

"Besides employing people at the hill itself, we provide many spinoff benefits to the local business people who run the gas stations, motels, taverns, and groceries and other stores. Also, building of new cottages in the area has increased tremendously in the last several years, thereby boosting the construction business."

Bartels, who has lived much of his life in the Lakewood area, concluded, "Northern Oconto County no longer closes down with the last day of deer season. The Paul Bunyan Ski Hill is an outstanding example of an outdoor recreation enterprise that used the natural resource base—that is, the land—to benefit the local economy. We feel that this base is worth protecting."

Mr. Garvey is district conservationist, SCS, Oconto, Wis.

Eroding areas were seeded with a mixture of 'Emerald' crownvetch, 'Empire' birdsfoot trefoil, 'Lincoln' smooth brome, and Kentucky bluegrass. A mulcher blew chopped straw coated with an asphalt emulsion over the seeded areas to protect them. The asphalt emulsion kept the straw from blowing away.

Farm Pond Saves Energy

by Charles F. McCluskey, Jr., and Charles N. Rinehart

A farm pond keeps a house cool when it's warm and warm when it's cool.

The farm pond with its many uses is one of the most popular conservation practices in Ohio. Traditional pond uses include livestock water, irrigation, spray water for orchards, recreation, fire protection, and control of runoff water and sediment. Some Ohio ponds may be taking on a new use: home heating and cooling.

Bob Groves and his family live on a farm near Bellefontaine in Logan County, Ohio. They asked the Soil Conservation Service to help them design a pond for recreation, fish, and wildlife.

"Originally, when we asked SCS for help, we just wanted a wildlife and recreation pond near the house," said Bob Groves. "Then we decided to expand the use of the pond to heat and cool our home."

Special features were added to the original design by an electrical contractor to meet the needs of the collection system for heating and cooling.

Heating and cooling more than 3,500 square feet of living space in the Groves' new home would be no small job. Working with the Groves through the Logan Soil and Water Conservation District, SCS checked the pond site, prepared the pond design, and helped during construction.

A 48-inch, 4-foot-long tile was buried vertically into the pond bottom. The open end of the tile protruded just above the pond bottom and was covered with wire mesh to prevent foreign materials from being sucked in.

Water is pumped from the spring-fed pond through a 1¼-inch plastic intake pipe, which was inserted into the side of the tile below the pond bottom and below frost depth. The water flows through the heating and cooling coils in the Groves' water-to-air heating and cooling pump system, then is discharged back into the pond at the waterline. The process continues upon demand by the central system, through the use of thermostats for each heating and cooling zone in the house.

The initial cost for installing the pond and the pump system is considerably more than that for an oil, electric, or propane system. The Groves' total system cost about $3,500 more, but costs will vary with pond size and pump system.

Bob's wife Judy, convinced that the system would work, said, "We wanted the pond anyway, and the abundant year-round source of water was just too good to pass up. The pump system will pay for itself in about 4½ years at current prices."

The Groves have not overlooked other benefits that their pond provides. Last summer they stocked the pond with bass and bluegill. They are building a dock to make it easier for swimming, boating, and fishing.

Now that the pond is more than a year old, Bob Groves said, "That pond is paying for itself every day in many ways. As utility costs increase, our savings will be greater. And looking forward to summer, the pond area is really a fine place to relax on a hot afternoon."

The Groves' heat pump system using pond water was put to the test last winter and worked fine. The pond provides a beautiful setting for the Groves' new home.

Mr. McCluskey was a soil conservationist, SCS, Somerset, Ohio, and is now district conservationist, SCS, Zanesville, Ohio.
Mr. Rinehart is a soil conservation technician, SCS, Bellefontaine, Ohio.

by Albert Neu

Keeping the Airport in Place

Among the erosion control measures installed at the Winslow airport was a formless concrete chute, which will stabilize the grade and prevent gullies from forming.

Erosion from bare ground around the airport in Winslow, Ariz., created a serious hazard. Wind erosion reduced visibility and left dust hanging in the air for hours. Rapid runoff from summer storms overflowed the runways and carried sediment into the Little Colorado River.

The Winslow City Council became concerned about this continuing problem. Not only did the erosion pose a serious safety hazard, but it aiso created ugly scars. Use of the airport was somewhat restricted and maintenance and repair costs were creating a financial burden on the city.

The 472-acre airport, located on the city's southside, includes two 7,000-foot lighted and paved runways, hangars, a National Weather Service Station, a Forest Service fire retardant loading depot, an animal shelter, and a city storage area.

The area had been in pasture before it became an airport and had been overgrazed. The sparse stand of plants that was left provided poor soil protection. Sheet and gully erosion reduced the plant cover even after the area was fenced to exclude livestock.

The Winslow City Council presented the erosion problem to the Little Colorado River Plateau Resource Conservation and Development (RC&D) Council and asked for assistance. The city council worked through the Navajo County Natural Resource Conservation District with the Soil Conservation Service to develop a plan for treating the area.

The first step was to make a soil survey. Then, based on the soils information, five possible treatments for the area were proposed. The sponsors selected a combination of two treatments for the severely eroding area which included terracing or pitting and seeding.

Land treatment measures installed included 3,183 feet of diversions and level terracing of about 63 acres. More than 2,300 feet of grassed waterway was constructed along with 900 feet of diversion dike and a 4-foot concrete drop structure. About 143 acres of a severely eroded area was seeded to alkali-sacaton, western wheatgrass, and fourwing saltbush.

The project was constructed in two phases over a 3-year period. City crews performed the work using city-owned equipment.

The city of Winslow provided about $12,000 of the construction costs with the balance of $50,000 being provided by RC&D financial assistance funds.

According to Winslow city officials, the waterways and diversions have already proved their worth. During a number of heavy thunder storms, water runoff and erosion were effectively controlled.

Mr. Neu is RC&D coordinator, SCS, Holbrook, Ariz.

Water Springs Up on the Range

by Kerry Powers

It was dry country in eastern Wyoming until a spring was tapped and water began to flow to the cattle.

Niobrara County's first community stockwater pipeline has been completed and it's running great.

The Van Blarcum Pipeline in northeastern Niobrara County, Wyo., is supplying water to hundreds of cattle on nearly 9,000 acres of rangeland owned and operated by four area ranchers—Dick Tollman, Vernon Chard, Herb Geike, and John Kreman, executor of the Jesse Wolff estate.

The pipeline, named for Tollman's grandfather-in-law, consists of about 65,000 feet of 1¼-inch diameter, 160 p.s.i., plastic pipe and works entirely by gravity flow from a newly developed spring that yields about 12 gallons a minute. There is a 575-foot drop in elevation from the top of the buttes on Tollman's property to the end of the pipeline. Seventeen new 8- by 2-foot fiberglass stock tanks with 1,000 gallon capacity and several existing tanks are being supplied with water year-round, with the farthest tank about 5 miles from the spring development. The pipeline is buried 5 feet below ground to prevent freezing and requires a pressure reducer because of the pressure buildup from the great drop in elevation.

The stockwater pipeline was laid then covered with gravel and soil. Only a small amount of land was disturbed.

Dick Tollman came up with the idea of developing the spring about 15 years ago, but the development wasn't feasible until plastic pipe became more common and he found some willing neighbors. It had been very difficult for the four ranchers to drill usable stockwater wells because water is scarce or too deep. The spring water helps by benefiting the cattle and improving range management.

Technical assistance for the pipeline was provided by the Soil Conservation Service working through the Niobrara Conservation District. Assistance included surveying and designing the spring development and the pipeline.

The participants share the cost of the project based on their share of the benefits. In addition, USDA's Agricultural Stabilization and Conservation Service provided cost-share funding.

Besides improving grazing rotation in the dry country, the water development will eliminate hauling water for cattle, the tanks will keep the cattle from having to walk so far, and the quality of the water will help their weight and health. Tollman said, "When the cattle have enough water to drink, they're going to convert the grass they eat into higher gains."

Throughout the year, unused tanks are shut off, thus insuring an adequate supply of water to the tanks that are being used. Since the spring flows continuously, the cattle will have water to drink during winter. To prevent the tanks from freezing over, according to Tollman, hadites—sections of porous pipe—with insulated lids have been installed around the floats to protect them and keep them from freezing.

"These stockwater pipelines are a great thing for this part of the country," said Jim Schwartz, SCS district conservationist. "They could benefit any ranch that could use more or better distribution of livestock water and has a good source of water." Schwartz added that the whole range ecosystem will benefit from improved water distribution and proper range management.

Mr. Powers was a soil conservation technician, SCS, Lusk, Wyo., and is now a soil conservationist, SCS, Powell, Wyo.

by Dean White
and Ron Nadwornick

An Unequaled Record

A long-time conservationist in Montana sees "convenience" farming lead to increased wind erosion.

Stanley Nelson checks the regrowth on an alfalfa stand after the first snowfall of the season. His forage base allows him to run cattle throughout the winter.

A Montana man, active in the conservation movement since the 1930's, recently expressed concern that sound conservation practices are being destroyed.

Stanley Nelson made the comments on the anniversary of 37 years of service as a supervisor for the Wibaux Conservation District—the first district organized in Montana. He served on the first board of supervisors and ever since, and his length of service to the conservation movement is unequaled in the State.

Nelson estimates that more than 10,000 acres of grassland has been converted to cropland in Wibaux County in recent years. Much of this land is marginal cropland and is more susceptible to wind and water erosion than when it is left in grassland.

According to Nelson, one reason for plowing marginal cropland is financial gain: Cropland sells for $100 to $200 an acre more than rangeland.

Nelson estimates that 20,000 acres of contour strips and field strips have also been taken out in the last 10 years and that over 100 acres of grassed waterways have been removed.

The reason for this destruction, Nelson notes, lies in convenience. New tractors can pull equipment that is 40 to 60 feet wide. Contour strips, field strips, and grassed waterways hinder the movement of the big rigs. It's easier to farm through them than around them.

The result is block farming. Some fields in the area are farmed in 80- to 160-acre blocks and some are even larger.

Nelson says that the increased wind erosion in the area is attributable to this block farming. "The dust storms around here seem more frequent and worse than just a few years back," he said, drawing on a lot of memories.

The larger the field the harder it is to protect the soil against wind erosion.

But Nelson hasn't given up hope. He firmly believes that "sound soil and water conservation practices are the keys to continued productivity. Practicing anything other than sound conservation is self-defeating and a poor legacy to leave our children."

Not all of the contours, strips, and grassed waterways have been torn up. Over the years the acres converted to these farming methods in the county number in the thousands. And much of the conservation on the land will remain. The dams, wells, and spring developments will continue to provide livestock water and the crossfences will help improve grazing distribution.

Nelson sees changes in conservation and knows his role—advocate the sound practices. His knowledge and unequaled record of service to conservation in Montana make Nelson a man whose time-tested advice is worth following.

Mr. White is district conservationist, SCS, Sheridan, Mont.
Mr. Nadwornick is district conservationist, SCS, Whitehall, Mont.

Trefoils: Backbone of Erosion Control

Three tough trefoils pass erosion control test.

by Jack Carlson
and Stan Swanson

The Pacific Northwest, west of the Cascade Mountains, abounds with rich, green forests, tall conifers and hardwoods, lush understory herbs and shrubs, and dense riparian zones. Plants seemingly spring from the ground with the abundant rainfall —a horticulturalist's paradise. Why, then, are plants needed for reducing erosion? Natural revegetation surely takes care of it all. There's probably very little erosion. Right? Wrong!

Road construction and other kinds of drastic soil disturbance contribute more than 5 million tons of sediment each year in western Oregon and western Washington. Of this, more than 2,000 miles of new logging road construction contributes up to 3½ million tons each year. Steep, south-facing, infertile roadcuts—eroding more than 200 tons per acre annually —permit, at best, only thin stands of native plants to gain a foothold.

Tough, new plants are needed and have been found. Three of the most important are trefoils, extensively tested by the Soil Conservation Service plant materials center at Corvallis, Oreg., and now available for use in revegetation projects.

Birdsfoot trefoil (Lotus corniculatus) is a long-lived, erect-growing perennial legume that persists well on road cuts in the northwest. The varieties 'Cascade' and 'Granger' have deep, branching taproots making them especially suitable for droughty sites. They are compatible with perennial grasses and rapidly developing, short-lived legumes. Birdsfoot trefoil is a key ingredient for maintaining cover on infertile sites because of its persistence and ability to fix nitrogen.

Dwarf English trefoil (Lotus corniculatus var arvensis) is similar to birdsfoot trefoil. 'Kalo', a variety released in 1976 by SCS and the Oregon and Washington Agricultural

For 9 years, 'Cascade' birdsfoot trefoil has sent out its branching roots into this roadcut, providing nitrogen and maintaining a good grass stand.

Experiment Stations, has short rhizomes and flowers profusely, making it ideal for roadside plantings. It is darker green and lower growing than Cascade and Granger trefoils, and is also well adapted to adverse sites. The low, spreading habit of Kalo dwarf English trefoil enables it to maintain dense stands even when heavily browsed by deer.

Big trefoil (Lotus pendunculatus) is also long-lived, adapted to acid and low-fertility sites, but thrives on wetness. Strong rhizomes enable it to spread rapidly. 'Marshfield' was released by SCS and the Oregon and Washington Agricultural Experiment Stations in 1972. It is semierect, dark green, and has distinctive red coloration on its stems and leaf margins.

Generally, Marshfield big trefoil performs best in the coastal zone where precipitation averages 60 inches or more annually. In lower precipitation zones of western Oregon and western Washington, Kalo, Cascade, or Granger trefoils usually perform best. In the below-60-inch precipitation zone, big trefoil can be added to mixtures containing dwarf English or birdsfoot trefoil to assure adequate cover on seepy areas of road cuts and fills, as well as along the lower portions of streambanks.

Kalo, Cascade, and Granger trefoils are known to be cold hardy. But Marshfield big trefoil has not yet been adequately tested in the high precipitation zone of the Cascade Range. Trial seedings are underway to compare Marshfield with 'Kaiser' big trefoil in the Cascades. Kaiser, a midwestern variety, is assumed to be cold tolerant.

Studies at the Corvallis Plant Materials Center and at problem site test areas show trefoils to be the backbone of successful seed mixtures. Rapid-developing grasses and legumes—such as dwarf intermediate wheatgrass, ryegrass, and sub-clover—can provide quick cover. White clover and sub clover produce ample nitrogen but must have special management to persist. Slow-developing, long-lived grasses—such as creeping red fescue, orchardgrass, and timothy—decline sharply in vigor and density as nitrogen is depleted.

But with the addition of trefoil, and occasional phosphorus applications, long-lived grasses maintain their vigor and density, and the trefoil persists indefinitely. Not only does trefoil remain green throughout the spring, summer, and fall, but during summer months it produces a profusion of attractive yellow flowers.

Mr. Carlson is a plant materials specialist, SCS, Spokane, Wash.
Mr. Swanson is manager, plant materials center, SCS, Corvallis, Oreg.

Foundation seed of 'Cascade' as well as 'Kalo' and 'Marshfield' trefoils is available to seed producers from the plant materials center, Corvallis, Oreg.

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Counting on You

SCS employees, did you know that your productivity is measured? Did you know that it is compared to that of other U.S. Department of Agriculture employees and other Federal Government agencies? Did you know that what you do makes a difference?

by William G. Hance

In September 1970, Senator William Proxmire, then a member of the Congressional Joint Economic Committee, urged the Comptroller General to investigate the feasibility of measuring the productivity of the Federal Government. Subsequently, the General Accounting Office, the Office of Management and Budget, and the Civil Service Commission—with the assistance of the Bureau of Labor Statistics—began a Federal productivity measurement effort.

During fiscal year (FY) 1972, 17 agencies, including the Soil Conservation Service, submitted input and output data for FY's 1967 through 1971. By FY 1977, 66 percent of the Federal work force was included in productivity measurement.

SCS has been measuring time and progress since 1936. SCS State conservationists and area conservationists have used the measurements to varying degrees to determine staffing and other management needs. Thus, SCS had input-output information on hand when the first productivity data were requested.

What Is Productivity?

Productivity is the ratio of outputs to inputs. Outputs are stated in units of products, such as cars manufactured, acres plowed, or chickens plucked. Input is labor expressed as employee years or labor costs.

Productivity is expressed as: Output per employee year or output per "X" number of dollars.

What Is a Productivity Index?

A productivity index is the relationship between productivity (output per employee year or "X" dollars) for a selected time period and productivity for a selected base period. The productivity index is usually expressed as a percentage with the base period being 100.

For example, if the FY 1978 productivity were 15 percent higher than the FY 1972 base year, the 1978 index would be 115.

Productivity Comparisons

The Federal Government's productivity measurement is combined with productivity measurement in private industry for an estimation of national productivity.

The U.S. Department of Agriculture can be compared to private nonagricultural industry because of similarities in output and input requirements.

Because it is primarily a service organization, SCS is compared with

How Does SCS Measure Up?

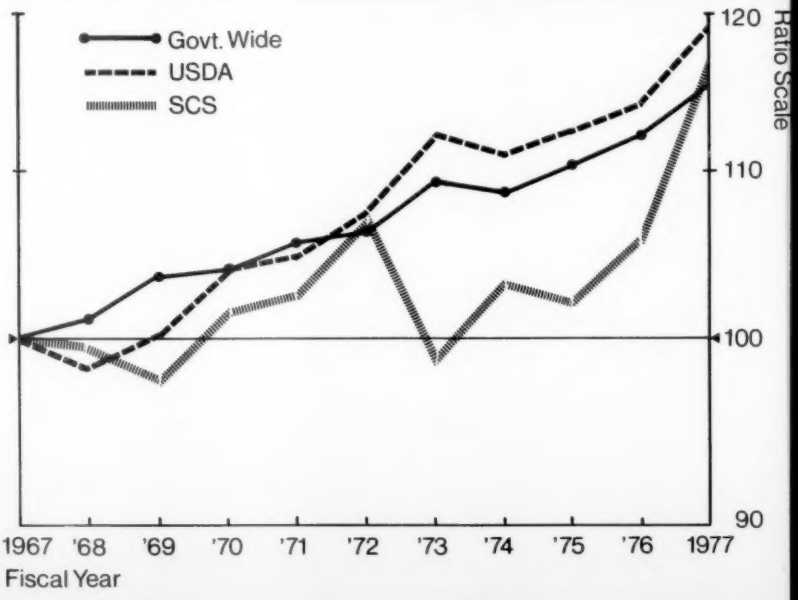
Productivity Index, Output per Employee Year

Federal Government

U.S. Department of Agriculture

Soil Conservation Service

Fiscal Years 1967–1977



This graph compares the productivity index of the Soil Conservation Service with USDA and Federal Government productivity.

Source of graphs:

Bureau of Labor Statistics U.S. Department of Labor

the portion of the nonagricultural sector that deals with service only, such as insurance, consultants, and hotels.

What Is Measured in SCS?

Virtually all employee time is included in SCS productivity measurements. Conservation operations (CO), for example, is divided into several financial projects. CO time input is assigned to specific outputs and each input-output element contributes to the SCS productivity index.

The FY 1977 SCS measurement included 21 separate measurement items. These varied from flood hazard studies with 55 employee-years input to conservation operations technical services with 8,979 employee-years input. SCS excluded only foreign assistance time from the productivity effort.

Factors Affecting Productivity

Three types of factors affect productivity: (1) people factors—including skills, knowledge, and motivation; (2) process factors—including technology, procedures, and legal constraints; and (3) product factors—including changes in quality or complexity of the product.

SCS employees need to consider each of these factors to determine where productivity problems exist or where improvement can be made.

Improving Productivity

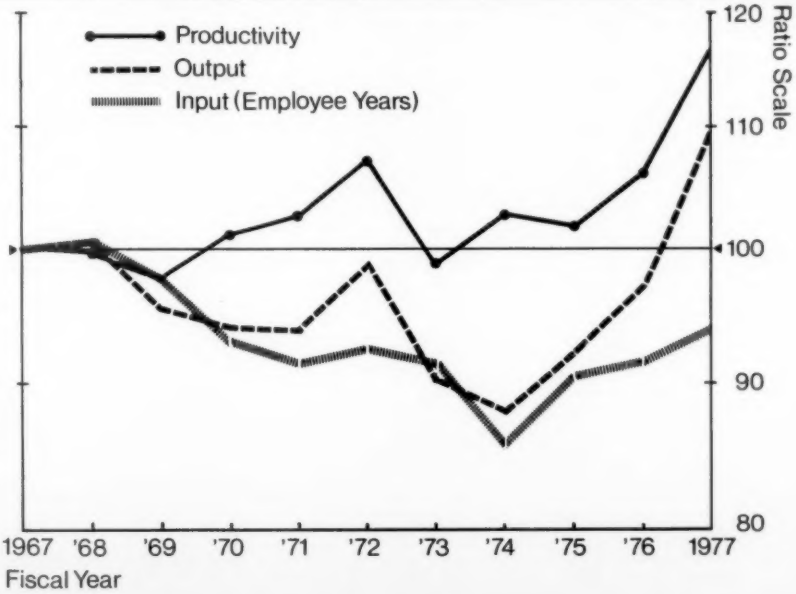
Improving productivity is necessary to: help combat inflation, maintain public confidence, meet new priority demands with limited funds, and give employees a sense of accomplishment. The way to increase productivity is to boost individual worker output. An employee's first responsibility is to increase his or her productivity. SCS line officers, for example, are responsible first for effective use of their time and then for improving their staffs' productivity through management efforts such as training, improving work organization or procedures, and capital investments. Improved productivity is a proof of the effectiveness of management at any administrative level.

Mr. Hance was a management analyst, Management Evaluation Division, SCS, Washington, D.C. He is now a soil conservationist, Inventory and Monitoring Division, SCS, Washington, D.C.

Productivity, Output, and Employee Years

Soil Conservation Service

Fiscal Years 1967–1977



This graph shows the input and output indexes that make up the SCS productivity index. Note that an increase in personnel does not necessarily result in an increase in productivity nor does a decrease in personnel necessarily result in a decrease in productivity.

Tree Bank for Stevens County

by Branislav Lalich

Land bank, soil bank—why not a "tree bank"? Clark Hedrick, tree committee chairperson for Stevens County Conservation District in Washington State, thought of the project 2 years ago as an outgrowth of the district's tree planting program.

Each spring for several years, under the tree planting program, the district has donated several hundred seedlings to local schools for celebration of Arbor Day. Local Department of Natural Resources people help the school children plant the trees and celebrate America's national tree day.

To augment this program, Hedrick suggested that blue spruce and Scotch pine be set aside to establish a "bank" with a local nursery. The district would provide the trees and the nursery would care for them until they were 4 years old.

To establish the tree bank program, the district signed an agreement with the Colville Floral Nursery. The nursery agreed to provide space, care, and labor.

The district provides 400 blue spruce and Scotch pine, and pays for the pots, potting material, and fertilizer. When the trees are ready for transplanting, the nursery receives 10 percent of the surviving trees. After 1 year under slats, many of the trees have grown to more than 2 feet in height.

When large enough, the trees are offered to civic organizations, clubs, Scouts, and schools at no cost. The only requirements are: planting can be used only for conservation or beautification; trees must be planted correctly in suitable soils; and proper care must be given to them after planting. Trees are provided only for public use. The district also provides guidance in planting trees and choosing good planting situations.

The program is so successful that Hedrick has arranged to increase the tree bank to 500 seedlings. Trees that have already been donated will be replaced.

To establish a balance between evergreens and broadleaves, the new seedlings will include caragana, sycamore, maple, European mountain ash, green ash, and Russian olive. Fir, spruce, and pine will bring the bank up to the 500 limit.

Colville Floral Nursery, under the management of Jane Armstrong, not only grows and sells flowers and shrubs, it also trains handicapped people in horticultural techniques, floral arrangements, and other skills needed in greenhouse and nursery work. The tree bank will offer another training opportunity for these people.

District Board Chairperson Lewis Lundy said he is pleased with the district's conservation effort, which has already stimulated several requests from civic groups for trees.

Nursery trainees place potted pine trees outdoors. These trees will be ready for donation under Stevens County Conservation District's tree bank program in 1982.

Mr. Lalich is a soil conservationist, SCS, Coleville, Wash.

SCS on Display

A permanent exhibit framed in the doorway of the Soil Conservation Service State Office in Des Moines, Iowa, lets people know about SCS. Located across from the cafeteria in the downtown Federal Building, the full-color, back-lighted display says: "Soil Conservation Service, a soil and water conservation agency of the U.S. Department of Agriculture . . . helping people plan and apply conservation practices to the land to keep Iowa's soil productive, its water clean, and its people prosperous."

The 10- by 7-foot exhibit was built by a private contractor and cost about $2,100, including the color transparencies. From the day it was installed, report SCS employees, people stopped referring to the office as "USDA" and began calling it the "Soil Conservation Service."

Cowboy Preacher

by Gene Warren

A retired preacher ministers to rangeland.

To see Seth Baggett galloping across the piney woods in Allen Parish, La., on his spirited quarter horse, you wouldn't think he is 76 years old and a retired preacher. Well, he is and will tell you that following close behind his love for God and people is his love for the land.

Baggett began married life trying to make a living following a mule on a small farm in Allen Parish. "I was doing pretty good until 1926 when I followed the call of God and laid down my plow and went off to the Moody Bible College," he said.

Baggett spent 50 years pastoring churches in and around Allen Parish, but his love for the land remained strong.

After Baggett retired, he went into the cattle business. "I am raising beef for the Lord," he said. "Each year we have several hundred people at our Bible Conference and Mission Camp, and homegrown, cheaper beef comes in handy. This piney woods grass is making it possible."

Baggett leases about 3,000 acres of pine and hardwood land owned by four timber companies in Allen Parish. Realizing he needed to manage the range grass for more and better cows, Baggett became a cooperator with the Calcasieu Soil and Water Conservation District. He worked with James Guillory, Soil Conservation Service district conservationist, to develop a conservation plan for the rangeland.

When Guillory and Jack Cutshall, SCS range conservationist, agreed to take a look at Baggett's rangeland, Baggett invited his neighbors and members of a Future Farmers of America chapter to share in the information. More than 70 people turned out to hear about improving the range.

While going over the range with Baggett, Cutshall and Guillory pointed out that cows like some grasses better than others. "That means," Cutshall explained, "that cows will hunt out the best grasses and leave the poor ones. If too many cows are on the range, sooner or later the best grasses are eaten out of existence."

Baggett figures that with the right practices, he will wind up raising a 90 percent calf crop at weights of 450 to 500 pounds—about 12,000 more pounds of beef each year from the same number of cows.

Cutshall and Baggett both say that it will take about 4 years to achieve this goal. Practices such as deferred grazing to revive the good grasses, relocating feeding areas, and pasture rotation are priority jobs for herd improvement.

Baggett said he isn't necessarily interested in increasing the number of cows but wants his present herd to be the best and one that will give him good calves with the least expense.

"The way I figure it, I can handle this herd with my good ol' horse," Baggett said. "With his help and the help of the Lord, we are going to make this piney woods grass put on a lot of good beef for God's children."

Seth Baggett rides range every day to keep track of his cattle. He uses conservation practices such as deferred grazing and pasture rotation to improve his herd.

Mr. Warren is public information officer, SCS, Alexandria, La.

Conservation Highlights 1978

Summary of Activities of the Soil Conservation Service for Fiscal Year 1978

In fiscal year 1978, the Soil Conservation Service (SCS) of the U.S. Department of Agriculture (USDA) helped farmers and ranchers apply minimum tillage on more than 4 million acres, use planned grazing systems on almost 9 million acres, and manage and conserve irrigation water on more than 2 million acres.

SCS helped landowners install 23,000 miles of terraces and nearly 500,000 acres of stripcropping during the year.

Critical area plantings were made on 409,000 acres to stabilize the soil, reduce sediment damage to downstream areas, and improve wildlife habitat.

SCS provided technical assistance to landowners with the installation and care of 7,266 acres of commercial fish ponds.

The number of agricultural waste management systems and the acreage of farmstead and feedlot windbreaks, grassed waterways, and tree planting also increased during the year.

Resources Conservation Act
The Soil and Water Resources Conservation Act (RCA), which became law on November 18, 1977, will guide the future of USDA's conservation programs. In fiscal year 1978, work was begun to complete the appraisal of the Nation's soil, water, and related resources. SCS conducted nearly 8,500 State and local level meetings attended by 155,500 people to obtain public views on resource conservation problems.

Rural Clean Water Program
Final rules and regulations for the Rural Clean Water Program (RCWP), prepared by SCS cooperatively with the Environmental Protection Agency, and the final environmental impact statement for the program were developed in fiscal year 1978. The Clean Water Act of 1977 authorized cost sharing through the RCWP to farmers and ranchers to establish and maintain best management practices for reducing agricultural related pollution of streams and lakes.

Rural Abandoned Mine Program
Final rules and regulations for the Rural Abandoned Mine Program (RAMP), established by the Surface Mining Control and Reclamation Act of 1977, were published on September 28, 1978. SCS will provide technical and cost-sharing assistance to land users in reclaiming rural non-Federal land damaged by surface mining for coal. Other USDA agencies, the U.S. Department of the Interior, State and local governments, and soil and water conservation districts also will cooperate in RAMP.

Pasture and Range Conservation
SCS helped farmers and ranchers with more than 2 million acres of pasture and hayland plantings. The agency also helped ranchers reseed more than 280,000 acres of range and use brush management on 2.3 million acres.

Woodlands and Windbreaks
SCS provided technical assistance to landowners in planting nearly 413,000 acres of trees, nearly 22,000 acres of farmstead and feedlot windbreaks, and more than 2,500 miles of field windbreaks. SCS helped landowners prepare 278,515 acres for planting or seeding forest crops and practice improved harvesting on an additional 915,700 acres in fiscal year 1978.

Agricultural Conservation Program
During the year, SCS provided technical assistance to 191,930 farmers and ranchers participating in the Agricultural Conservation Program.

Great Plains Conservation Program
In the 10 Great Plains States, 1,702 farmers and ranchers signed long-term contracts to apply permanent conservation measures on 4.1 million acres.

Conservation Help for Units of Government
SCS assisted 25,406 local and State governments with area planning during the year. SCS also prepared more than 15,000 natural resource inventories and evaluations to be used by local governments in developing quality standards for conservation land use and treatment.

Soil Surveys
In fiscal year 1978, 92 soil survey reports were published and an additional 80 survey manuscripts with accompanying maps were sent to be printed. More than 57 million acres were mapped during the year.

Snow Surveys
SCS snow surveyors in the West took more than 40,000 measurements of snow and other precipitation, temperature, and soil moisture during the year and issued 3,885 water supply forecasts. More than 200 of the 500 planned automated data sites were operational.

Plant Materials
SCS plant materials centers released 17 new conservation grasses, legumes, wildflowers, shrubs, and trees to seed growers in fiscal year 1978. The plants will be used to stabilize critical areas, reclaim surface mined lands, control wind erosion, improve range and pasture and wildlife habitat, and prevent nonpoint source water pollution.

Recreation and Wildlife
SCS provided technical and financial assistance for establishing or expanding 602 public recreation developments during the year. SCS also assisted more than 11,000 private landowners in developing commercial and noncommercial recreation facilities.

SCS helped landowners convert more than 200,000 acres from other uses to wildlife and recreation areas and improve 14.7 million acres of land and water for wildlife. The nearly 40,000 ponds installed with SCS assistance also benefit wildlife.

Small Watershed Projects
During fiscal year 1978, 24 more small watershed projects were completed, bringing to 474 the number completed since the program began in 1954. These Public Law 566 projects combine conservation measures and structural and nonstructural measures to reduce flood damage and provide agricultural water management, municipal and industrial water, recreation, and wildlife habitat.

Emergency Assistance
Under Section 216 of the Flood Control Act of 1950, about $42 million was obligated for emergency restoration work to protect life and property in 30 States.

Environmental Services
In addition to preparing its own environmental impact statements, SCS commented on 471 environmental impact statements for other agencies and cooperated in numerous environmental assessments throughout the Nation.

Flood Plain Management
SCS completed 76 flood hazard studies in 28 States during fiscal year 1978. Through the studies, SCS provides information on managing flood plains to local governments and provides information needed by the U.S. Department of Housing and Urban Development in determining flood insurance rates.

SCS issued draft rules and regulations which emphasize the agency's role in providing leadership in the wise use of flood plains and revised flood hazard studies to identify the value of flood plains in their natural state.

River Basin Studies
Through the River Basin Program, SCS has USDA leadership for water and related land resource planning assistance to Federal, State, and local governments. SCS also leads USDA participation in Water Resources Council interagency studies.

Colorado River Basin Salinity Control Program
Under Public Law 93-320, SCS is cooperating with the Bureau of Reclamation to reduce salt concentration in the Colorado River, primarily by improving onfarm irrigation water management. Under Title I of the act, the major practices installed include land leveling, ditch lining, and structures for water control and measurement. Title II salinity control studies were going on in seven areas covering some 605,000 acres of irrigated land, plus thousands of acres of non-Federal dry cropland and range.

Resource Conservation and Development Areas
During fiscal year 1978, work continued in the 178 areas authorized for assistance under the Resource Conservation and Development (RC&D) program. No new areas were authorized for RC&D assistance.

Summary of Progress Fiscal Year 1978

Reportable progress in soil and water conservation programs assisted by the Soil Conservation Service

Metric Conversions
To assist readers, information in the tables is given in metric and in units of common measure. A hectare is equal to 2.471 acres; a kilometer is equal to 0.6214 mile.

Progress Item		Fiscal Year 1978	Cumulative to Sept. 30, 1978
Conservation Plans and Related Services			
District cooperators	No.	60,846	2,211,087
	acres	21,280,684	777,714,497
	hectares	8,612,080	314,733,280
Services to land users	No.	2,560,958	—
Individuals and groups assisted	No.	921,381	—
Individuals and groups applying practices	No.	458,585	—
Conservation plans	No.	47,474	1,764,621
	acres	22,608,531	608,933,294
	hectares	9,149,446	246,429,215
Conservation plans revised	No.	22,559	—
	acres	15,611,643	—
	hectares	6,317,875	—
Inventories and evaluations	No.	90,033	—
Federal land units in coordinated conservation plans	No.	27	1,336
Federal lands in coordinated conservation plans	acres	524,020	15,156,069
	hectares	212,066	6,133,510
Conservation Help for Units of Government			
Technical services for area planning	No.	111,263	—
Land use and treatment site plan reviews	No.	23,449	—
Agencies assisted	No.	25,406	—
Resource plans	No.	625	—
Inventories and evaluations	No.	15,890	—
Snow Surveys and Water Supply Forecasting			
Hydrometeorological measurements	No.	40,090	—
Snow survey and water supply forecasts	No.	3,885	—
Resource Surveys			
Resource studies	No.	2,831	5,521
Resource reports	No.	514	955
Soil Surveys			
Soil Surveys	acres	57,590,621	1,424,413,830
	hectares	23,306,348	576,446,033

Progress Item		Fiscal Year 1978	Cumulative to Sept. 30, 1978
Great Plains Conservation Program			
Applications received	No.	2,741	60,863
	acres	7,240,466	119,546,051
	hectares	2,930,144	48,379,091
Contracts signed	No.	1,702	55,944
	acres	4,111,634	104,574,730
	hectares	1,663,937	42,320,348
Contracts terminated	No.	203	3,521
	acres	458,378	4,225,725
	hectares	185,501	1,710,109
Contracts completed	No.	1,868	38,802
	acres	3,770,662	69,372,040
	hectares	1,525,949	28,074,171
Unserviced applications on hand	No.	4,899	—
Agricultural Conservation Program			
ACP referrals serviced	No.	191,930	—
Recreation Developments Established			
Private	No.	11,787	—
Public	No.	602	—
Public Law-566 Watershed Projects			
Applications	No.	15	2,861
Authorized for planning	No.	5	1,774
Approved for construction	No.	11	1,197
Construction starts	No.	5	966
Projects completed	No.	24	474
River Basin Studies			
Initiated	No.	13	158
Completed	No.	14	97
Flood Hazard Studies			
Flood hazard analyses	No.	38	155
Flood insurance studies	No.	38	229
Colorado River Basin Salinity Control Program			
Applications received	No.	47	216
Contracts signed	No.	37	101
	acres	4,931	14,661
	hectares	1,996	5,933
Contracts—structural measures completed	No.	23	54
	acres	3,487	8,420
	hectares	1,411	3,407

Progress item		Fiscal Year 1978	Cumulative to Sept. 30, 1978
Resource Conservation and Development Areas			
Application on hand	No.	—	64
	acres	—	278,281,000
	hectares	—	112,617,530
Areas authorized for assistance	No.	—	178
	acres	—	755,886,000
	hectares	—	305,899,500
RC&D area plans accepted	No.	—	163
	acres	—	688,901,000
	hectares	—	278,791,340
RC&D measures completed	No.	1,823	13,947

Practice		Fiscal Year 1978
Agricultural waste management systems	No.	2,254
Brush management	acres	2,326,143
	hectares	914,367
Critical area planting	acres	542,124
	hectares	219,392
Farmstead and feedlot windbreaks	acres	21,619
	hectares	8,749
Field windbreaks	miles	2,565
	kilometers	4,128
Fishponds, commercial	acres	7,266
	hectares	2,940
Fishpond management	No.	40,020
Grassed waterways or outlets	acres	100,027
	hectares	40,480
Irrigation systems	No.	13,544
	acres	1,830,862
	hectares	740,932
Irrigation water conveyances	miles	8,554
	kilometers	13,099
Irrigation water management	acres	2,485,455
	hectares	1,005,839
Minimum tillage	acres	4,246,657
	hectares	1,718,580
Pasture and hayland plantings	acres	2,087,622
	hectares	844,840
Planned grazing systems	acres	8,807,512
	hectares	3,564,312
Ponds	No.	39,842
Proper woodland grazing	acres	1,014,106
	hectares	410,399
Range seeding	acres	280,388
	hectares	113,470

Practice		Fiscal Year 1978
Reclamation of surface-mined land	acres	39,136
	hectares	15,838
Stripcropping	acres	498,907
	hectares	201,903
Subsurface drainage	miles	36,543
	kilometers	58,810
Surface drainage	miles	5,124
	kilometers	8,246
Terraces	miles	23,232
	kilometers	37,388
Tree planting	acres	412,820
	hectares	167,064
Wildlife upland habitat management	acres	14,125,146
	hectares	5,716,305
Wildlife wetland habitat management	acres	554,742
	hectares	224,499
Windbreak renovation	acres	7,111
	hectares	2,878
Woodland, improved harvesting	acres	915,700
	hectares	370,575
Woodland improvement	acres	429,161
	hectares	173,677
Woodland site preparation	acres	278,515
	hectares	112,712
Land Treated for Erosion		
Land adequately treated	acres	43,760,852
	hectares	17,709,580

Land Use Conversions		SCS-assisted conversions Fiscal Year 1978
Cropland to grassland	acres	548,273
	hectares	221,881
Cropland to woodland	acres	36,910
	hectares	14,937
Cropland to other uses	acres	71,754
	hectares	29,038
Grassland to cropland	acres	387,246
	hectares	156,715
Any use to wildlife-recreation land	acres	213,991
	hectares	86,600
Woodland to cropland	acres	63,307
	hectares	25,620
Woodland to other uses	acres	72,589
	hectares	29,376

Research Roundup

Contour Furrows Make Deserts Bloom

Contour furrowing increased forage production by 123 percent on arid southeastern Montana rangeland sites during 6 years of tests conducted by USDA's Science and Education Administration (SEA).

Forage production is notoriously poor in this part of Montana because scant precipitation and low soil infiltration rates limit the water stored in the soil. Though contour furrowing is known to increase rangeland soil water, until now its effects on forage production have been unknown.

To learn these effects, Earl L. Neff, SEA hydraulic engineer, and J. Ross Wight, SEA range scientist, at Sidney, Mont., established 16 watershed study sites on saline upland and panspot range. The saline sites were ordinary uplands where salt and/or alkaline accumulations were apparent. Panspots were areas where hard clays or similar materials lie close to or at the soil's surface in shallow depressions.

Half of the watersheds at each site were left in their natural condition and half were furrowed. Over the 6-year study period, contour furrowing increased forage production by 86 percent on the saline uplands and 159 percent on the panspot sites.

The researchers found that the increased forage production was a direct result of increased soil water content. Overwinter soil water recharge on the contour-furrowed saline upland sites was increased 157 percent and 162 percent on the furrowed panspot sites. Higher infiltration on the panspot sites accounted for the differences between the two types of sites.

The contour furrowing increased the soil water by creating additional surface storage, reducing spring and fall runoff, and providing a longer time for precipitation to infiltrate into the soil. Also, furrows increased the amount of snow water trapped and stored for later plant use by 60 percent.

New Laboratory for Soil Erosion Research

Construction of a $3.6 million National Soil Erosion Laboratory should be underway by summer 1979, according to Earl R. Glover, acting regional administrator for agricultural research of USDA's Science and Education Administration (SEA).

The laboratory will be built on the Purdue University campus in West Lafayette, Ind., and should be ready for occupancy by late 1980 or early 1981. The two-story building will provide space for about 15 SEA agricultural research scientists and a support staff of 22.

"There also will be space for cooperating Purdue research and teaching staff as well as graduate students and visiting scientists," Glover said. "We will give special attention to erosion problems on disturbed lands, such as strip mine and construction sites."

Control Evaporation and Save Water, Energy, and Money

The sun saps up to 6 feet of water as evaporation each year in areas of Arizona, New Mexico, and southern California and somewhat less in other warm areas.

That's enough water loss for farmers and ranchers to give a little thought to eliminating some of the evaporation from small ponds and stock tanks to save time, labor, energy, and, of course, water.

Hauling costs, depending upon the area and cost of water, range from $10 to $30 per 1,000 gallons while evaporation control may cost less than $1.50 per 1,000 gallons.

Keith R. Cooley, hydrologist of USDA's Science and Education Administration (SEA), Phoenix, Ariz., has tested several materials that cut evaporation losses up to 100 percent for the area of water covered.

He finds that wax is feasible and easy to work with in hot climates but has tested several other materials including perlite, Styrofoam, butyl rubber, and even floating concrete blocks. The blocks aren't "normal" blocks—the aggregate used is perlite rather than sand or gravel.

Cooley applies the wax by melting and pumping it directly onto the water where it forms a layer about ¼-inch thick. During the study, he used a regular roofing heater to heat the wax but says farmers and ranchers could use any tub or drum to heat the wax and ladle it onto the water surface. In the hottest climates, the wax can be applied as blocks which

melt and form a complete cover. Paraffin wax can be bought from the manufacturer in 11-pound slabs for about 20 cents per pound.

Another way to curb evaporation losses was developed by Allen R. Dedrick, SEA agricultural engineer. He took 3-foot wide strips of ¼-inch-thick foam rubber, glued them together, cut them to form a cover for a stock tank, and floated them on the surface of the water. Small holes were cut in the cover to vent air and let in water. Cost of the foam rubber is about 25 cents per square foot.

Another of Cooley's methods on larger ponds was to sprinkle loose perlite directly from bags onto the surface of the water. On one 53- by 78-foot pond in Arizona, the perlite cut evaporation 20 percent during an 8-month period. Perlite, like other loose materials, has a tendency to stack up on the lee side of a pond when wind velocities are brisk; however, it redistributes when the wind recedes.

Along with saving water, the materials reduced algae in small ponds and tanks by cutting off sunlight and inducing cooler temperatures.

Topsoil Needed for Mine Spoils

Many of the problems encountered in revegetation of surface mine spoils can be solved by covering undesirable spoils with good soil material, according to James F. Power, soil scientist with USDA's Science and Education Administration.

Power said that as little as 2 inches of topsoil applied over spoils increases infiltration of water several times.

Power, stationed at the Northern Great Plains Research Center, Mandan, N. Dak., said the thin layer of topsoil absorbs raindrop impact, reducing the surface sealing effect that normally occurs on sodic spoils. However, 2 inches is of little value in increasing water holding capacity or the fertility of the root zone.

Research with various depths of topsoil added to spoils high in sodium content, which are common in the Great Plains, indicates that about 28 inches of soil is needed to bring production of spring wheat, alfalfa, crested wheatgrass, and native grasses back to original, premined, production levels.

Power warned that results so far are short term. Topsoil thickness may need to be increased somewhat to overcome salt migration upward from the spoil into the topsoil. And such influences as surface erosion and poor drainage at the soil-spoil interface may also become apparent as the research continues. These could indicate a need for thicker applications of topsoil.

"Because the topsoil added to the spoil is so susceptible to erosion, we are studying the feasibility of adding a few inches of water after the soil material is spread and seeding immediately," Power said. This approach would reduce the erosion problem as well as allow seeding during any part of the growing season.

The effects of supplemental watering on stand establishment, plant species competition, survival, and production are also being investigated at Mandan.

On sloping areas, proper land shaping, in conjunction with application of the topsoil, could increase the potential production after mining, according to Power.

"Although the reclamation procedures currently required in most States seem adequate for restoration of plant growth, many problems require additional research. Because these recently developed reclamation techniques have been used for only a few years, the long-term stability of the materials, of the landscapes and surface drainage, and of the perennial vegetation is largely unknown," said Power.

"Much research remains to be done, but the outlook for restoring or enhancing the potential for producing vegetation useful to man seems promising if the technology developed to date is properly used," Power concluded.

Let a Computer Tell You When to Irrigate

Farm irrigation efficiencies, currently averaging about 40 percent, could be increased at least 10 percent over the next decade to stretch our water resources without increasing energy requirements, according to USDA's Science and Education Administration (SEA).

The key to this increase is the SEA Irrigation Scheduling Program which tells farmers when to irrigate and

how much water to use based on soil and weather data fed into a computer. The premise is that the right amount of water applied at the right time will result in maximum quality and production of any given crop.

SEA studies show that farmers who rely on intuition and past experience to determine when and how much water to apply to their crops often waste more than 25 percent of their water. The wasted water reduces yield by flushing fertilizers below plant roots before the plant can use them. Furthermore, neither intuition nor past experience prepares farmers for severe drought.

The scheduling program was first developed by SEA Agricultural Engineer Marvin E. Jensen and Soil Scientist James L. Wright, Kimberly, Idaho, in 1970 and made available to growers in 1971. SEA Agricultural Engineer Dale F. Heerman, Fort Collins, Colo., incorporated rainfall into the schedule and adopted the program to center pivot sprinkler systems.

Acreage being irrigated under scheduling has increased from an initial 100,000 acres in 1971 to more than 800,000 acres in 1977. Currently, scheduling is being used in Nebraska, Kansas, Colorado, Washington, Texas, Arizona, New Mexico, California, Wyoming, and Idaho, but it can be applied in all States where irrigation is practiced.

Cost of the service depends on location, crop, and length of growing season and averages $4 to $5 per acre, which includes periodic field inspection by trained and experienced technicians. Fertilizer savings alone can more than make up for scheduling's expense.

"Farmers report that they can maintain high yields yet reduce nitrogen fertilizer applications by 40 to 50 pounds per acre and in some extreme instances by 100 pounds," said Heerman.

Utility costs will also be lowered by scheduling irrigations during nonpeak electrical power periods.

In a typical scheduling service, daily evapotranspiration and cumulative crop water use for a grower's field are automatically updated by the computer using current climatic data. The dates and the amount of the last irrigation or rainfall are fed into a computer which then prints out a daily water use figure for that field and predicts the date the next irrigation will be required and how much water will be needed.

Besides saving water and fertilizer, scheduling frees growers from the chore of checking moisture in the field and allows more time for other management decisions.

Meetings:

March	
3–7	Association for Supervisors and Curriculum Development, Detroit, Mich.
3–8	American Society of Planning Officials, Miami, Fla.
14–16	Hardwood Manufacturers Association, Washington, D.C.
18–20	American Pulpwood Association, Atlanta, Ga.
18–23	The American Society of Photogrammetry, Washington, D.C.
23–25	National Wildlife Federation, Toronto, Ontario, Canada
24–28	North American Wildlife and Natural Resources Conference, Toronto, Ontario, Canada
April	
1–6	American Concrete Pipe Association, San Antonio, Tex.
4–6	Engineering Geology and Soils Engineering Symposium, Moscow, Idaho
22–25	Association of American Geographers, Philadelphia, Pa.
May	
1–3	International Association for Great Lakes Research Conference, Rochester, N.Y.
23–25	Southern Forestry Conference, Memphis, Tenn.
28–June 1	American Geophysical Union, Washington, D.C.

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